A PRINTER AND METHOD THEREFOR ADAPTED TO SENSE DATA UNIQUELY ASSOCIATED WITH A CONSUMABLE LOADED INTO THE PRINTER

FIELD OF THE INVENTION

This invention generally relates to printers and printer methods and more particularly relates to a printer and method therefor adapted to sense data uniquely associated with a consumable loaded into the printer.

BACKGROUND OF THE INVENTION

An exemplary type of printer is an inkjet printer. In this regard, as inkjet printing technology increasingly achieves higher performance standards, inkjet printers are becoming more widely used for high-quality imaging, particularly in graphic arts applications, color printing, and proofing. In comparison with inexpensive "desktop" color printing applications, high-quality imaging applications require considerably more control over printing factors such as dot registration, dot size, ink density, color gamut and overall repeatability. Among digital color prepress systems, the "REALIST"™ printer (manufactured by IRIS Graphics, Inc., located in Bedford, Massachusetts) and the "SILVER REED"™ printer (manufactured by Silver Seiko Ltd., located in Tokyo, Japan) exemplify printers that achieve high-quality imaging using inkjet technology.

To serve the needs of this high-quality imaging market, manufacturers of inkjet printers and suppliers of consumable components, head-cleaning chemicals, inks, and receiver media manufacture these systems and consumables to exacting standards. Consumable inks used in these applications are tested to provide sensitometric performance within tight tolerances. Consumable receiver media (such as paper, film, textiles, and other substrates) are expected to be manufactured within a narrow range of variability for color, thickness, coating, and other characteristics. Printheads, which may be considered disposable (therefore considered as "consumable") with some systems, are precision-fabricated to provide repeatable performance, print to print. The need for high quality forces manufacturers of inkjet consumables to test and market consumable products that, in part, compensate for variability allowed with other

consumables. This drives up the cost of consumables and increases the overall cost of operation to the owner of the inkjet printer.

To maintain high quality standards, consumables manufacturers routinely test and certify their products for performance within a required range. Consumable inks, for example, are characterized sensitometrically to provide repeatable response within a controlled color space. Inks may be differently formulated based on dye or pigment quality, intended use, or variable manufacturing conditions. While manufacturers collect and store this type of detailed consumables information, such information is not generally available to the end user or to the inkjet printing system itself. If such information were available, it could be used by control logic within the inkjet printer to optimize processing and printing and improve the overall level of imaging performance achieved by the inkjet printer. And if detailed information from manufacture were available on each type of consumable loaded in the printer, a control program on the printer could compensate for combinations of consumables, allowing the printer to adjust its imaging parameters accordingly.

Conventional inkjet printers have been adapted to identify the types of ink and paper loaded. U.S. Patent No. 5,812,156 (Bullock, et al.) discloses use of a memory IC integrated into an ink cartridge or printhead and used to store usage information and data regarding variables such as ink type, manufacture date and batch, and performance. Here, a separate electrical connector is disclosed for making connection with memory circuitry when the ink cartridge is inserted into the printer. However, the requirement for electrical connection to the inkjet cartridge places demands not only on the design of the cartridge itself, but also on the design of the printer, because a corresponding connector must be provided to mate with the connector on the ink cartridge. Over time, electrical contacts that require regular connection and disconnection, such as occurs when an expended ink cartridge is removed and a new one inserted, provide a potential source for problems. Electrical contacts are known to break, collect dirt, corrode, or become misaligned, for example. This type of design solution may be workable with a low-volume desktop inkjet printer that employs a cartridge-based ink supply.

However, large-capacity inkjet printers such as the "REALIST"™ and "SILVER REED"™ printers noted hereinabove use ink supplied from bottles, where direct electrical connection to the ink source is not easily provided.

U.S. Patent No. 5,365,312 (Hillman, et al.) also discloses use of a memory associated with an ink reservoir for an inkjet printer. Here again, the solution disclosed requires an electrical connection with the memory component, which requires redesign of conventional ink bottle packaging to include a memory chip and a connector.

For use with such large-capacity printers, it would be beneficial to provide memory integrally attached to the ink consumable, where the memory could then be used to store manufacturing, performance, and usage information. It would be especially advantageous if redesign of packaging and addition of a separate connector were not required.

International patent WO 98/52762 (Purcell, et al.) discloses an inkjet printer in which memory circuits are disposed within ink and paper consumables, including memory connected with an RF transponder that is attached to a roll of paper media. Contactless communication, using an RF transceiver built into the inkjet printer, provides added advantages in situations where it would be difficult to maintain physical electrical contact with a rotating paper roll during operation.

In addition to consumable inks and paper used directly for imaging, a large-format inkjet printer may also include consumable fluid for printhead cleaning. A printhead in such a printer can be used with different types of ink and, correspondingly, can require different cleaning fluid formulations. Memory attached to the cleaning fluid consumable can be used to identify the formulation of the cleaning fluid consumable and to store usage information. Such information could also be used by the printer to make sure that the proper cleaning fluid is installed for the ink currently being used. In addition, because these fluids may include solvents or chemicals that might require collection and return to a disposal facility after use, it would be beneficial to identify the specific formulation of waste cleaning fluid collected in a waste bottle or other container.

Doc. No. 5365,312

This same advantage would apply for waste inks, in systems that employ a "continuous-flow" output, in which unneeded droplets of ink are deflected to a waste container.

In the memory solutions disclosed above, usage data is currently obtained by counting. In the simplest implementations, printer logic counts the number of prints generated and stores these values in memory to maintain a rough estimate of consumables usage. Or, printer logic directly counts the number of ink droplets expelled from a specific ink reservoir. Tracking usage in this manner has some inherent disadvantages, because some type of averaging and estimation must be used. Moreover, for cleaning fluid consumables, a counting method of this type could only provide a gross estimation of usage and of fluid remaining. It would be advantageous if a consumable device had a built-in sensing mechanism that, acting in cooperation with integrally connected memory components, accurately indicated the amount of a consumable used or remaining. Conventional sensing methods include mechanical level-sensing, but do not integrally couple level-sensing with attached memory components.

A printhead may be used with specific inks or with specific receiver media and, in some inkjet printers, is considered a consumable item. There may be instances where usage data stored with the printhead is useful for maintaining reliable printer operation. Previously mentioned U.S. Patent No. 5,812,156 also discloses a memory circuit attached to a removable printhead. Electrical contacts to the memory circuit are provided in the printhead interface to the printer. This allows identification of printhead type, provided that the printhead is installed in the printer apparatus.

In an inkjet printer, the ability of control logic to access detailed information on consumable receiver media, inks, and cleaning fluids, and on the printing hardware itself, helps to optimize the writing process and provides tools for maximizing image quality. Thus it can be seen that there is a need for an inkjet printer that is adapted to sense types of consumable receiver media, inks, cleaning chemicals, and printhead. The capability of the printer to perform this

type of sensing without making physical contact with the consumable package would present cost, ease of use and reliability advantages.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a printer and method therefor adapted to sense data uniquely associated with a consumable loaded into the printer.

With this object in view, the present invention resides in a printer adapted to sense data uniquely associated with a consumable loaded therein, comprising a transceiver for transmitting a first electromagnetic field and for sensing a second electromagnetic field; a transponder coupled to said consumable, said transponder adapted to receive the first electromagnetic field and generate a second electromagnetic field in response to the first electromagnetic field received thereby; and a memory coupled to said transponder, said memory having the data stored therein uniquely associated with the consumable, whereby the second electromagnetic field caries the data stored in said memory while the second electromagnetic field is generated, so that the second electromagnetic field is characteristic of the data stored in said memory.

According to an aspect of the present invention, an inkjet printer includes an ink supply reservoir which is adapted to provide information about the ink included therein by means of a non-volatile semiconductor memory component that is integrally contained in a transponder. The memory component may be, for example, an EEPROM (Electrically Erasable Programmable Read-Only Memory). Stored in the memory component are encoded data indicative of manufacture and performance attributes of the ink. Similarly, a receiver media supply is loaded into the inkjet printer, with a memory integrally contained in a transponder attached to the receiver media supply. A cleaning fluid and waste container are each adapted for non-volatile memory storage in a similar fashion, each having a memory integrally attached to a transponder. Each transponder is capable of receiving a first electromagnetic field generated by a radio-frequency transceiver unit. Each transponder provides power to its semiconductor circuitry as the transponder receives the first electromagnetic field. When the transponder

circuitry is powered, the component generates a second electromagnetic field in response to the first electromagnetic field. The second electromagnetic field contains data about the consumable item. The radio frequency transceiver unit senses the second electromagnetic field and extracts the data content for subsequent processing by a control logic processing unit that operates the inkjet printer.

A feature of the present invention is the provision of a radio frequency transceiver capable of transmitting a first electromagnetic field to be intercepted by a transponder having data stored therein indicative of the consumable, the transponder capable of generating a second electromagnetic field to be sensed by the radio frequency transceiver.

A further feature of the present invention is the ability of the radio frequency transceiver to address a specific transponder component and to write data to that component, where the data written is indicative of usage of a consumable.

It is an advantage of the present invention that it obviates the need for manual entry of data describing an inkjet consumable. Instead, the invention provides information to the operator or to the inkjet printer apparatus itself about a consumable that is loaded in the printer.

It is a further advantage of the present invention that it allows control logic in an inkjet printer to determine the type of consumable that is loaded and to access related data about the consumable, such as manufacturing date, batch number, and chemical type, and, in turn, to record on the memory circuitry that is provided with that consumable useful data on usage and other processing information.

It is a further advantage of the present invention that it provides a contactless communication interface, accessing data without requiring that electrical contact be made to corresponding contacts mounted on consumable packaging.

It is a further advantage of the present invention that it allows backward-compatibility with existing packaging designs for consumables. That is,

consumables provided with transponder components can be used in older inkjet printers that may not be equipped with the necessary transceiver and logic circuitry that enable use and management of consumables data. No substantial alteration of external packaging is necessary to implement this invention.

It is a further advantage of the present invention that it allows calibration data, sensitometry data, and other detailed performance information about the consumable to be stored and provided as part of the consumables packaging, so that detailed information is integrally attached to the consumable. Thus, should a consumable item be moved from one inkjet printer to another, for example, usage information is retained.

It is a further advantage of the present invention that it provides a method for measuring and storing consumable levels, where this method is not dependent on a print count with its inherent inaccuracies.

It is a further advantage of the present invention that it allows an inkjet printer to adapt to interacting consumables loaded therein, so that, for example, consumable receiver media from a known batch can be printed upon optimally when used with consumable inks from a known batch. Or, printer operation could be temporarily disabled if the type of ink loaded is not compatible for a specific printhead or if a printhead cleaning fluid must be changed in order to suit a specific ink type.

It is yet a further advantage of the present invention that it provides a memory coupled to a waste fluid container, allowing automated identification of fluid composition as an aid to environmentally acceptable disposal of the waste fluid.

These and other objects, features, and advantages of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings wherein there is shown and described illustrative embodiments of the invention.

09374505.061509

BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter of the present invention, it is believed that the invention will be better understood from the following description when taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a perspective view of an inkjet printer adapted to sense consumables, with a panel opened to show location of consumable fluids;

Figure 2 is a schematic diagram showing functional relationships of components within an inkjet printer that has been adapted to sense its loaded consumables; and

Figure 3 is a view in perspective of a cutaway of Figure 1.

DETAILED DESCRIPTION OF THE INVENTION

The present description is directed in particular to elements forming part of, or cooperating more directly with, apparatus in accordance with the invention. It is to be understood that elements not specifically shown or described may take various forms well known to those skilled in the art.

For the description that follows, the general term "consumable" is used to include the following items that may be loaded or installed in an inkjet printer:

(1) Receiver media, the substrate on which the viewable image is printed (for example, paper, cardboard, film, textile, vinyl);

(2) Ink, typically provided in the four process colors, cyan, magenta, yellow, and black, with the possible addition of other colors;

(3) Cleaning fluid, used to cleanse the printhead, which fluid may be collected after use in a waste container stored within the printer; and

(4) Printhead, where the user is required to replace the printhead or to interchange printheads based on the ink or receiver media in use.

Fig. 1 shows a high-quality inkjet printer, generally referred to as 10, that has been adapted to sense data uniquely associated with consumables loaded therein. Hinged front panels 12 are shown opened in Fig. 1 to provide a view of ink reservoirs 14a/b/c/d, a cleaning fluid bottle 16, and a waste bottle 18.

09537499.061600

Paper 24 is loaded in individual sheets from a tray 20. A printhead 22, supplied with ink by a pumping assembly 34, writes the image to paper 24 which is pulled out from tray 20 and loaded onto an imaging drum 26. A control console 30 which serves as, a separate computer connected to inkjet printer 10, is used to monitor and control inkjet printer 10 operation. Control console 30 performs operations such as file transfer and job queuing, and displaying maintenance and error messages. A computer program running on control console 30 performs the logic control processing functions of the printer, providing operating instructions to a machine control processor 32, which is a microprocessor-based controller that runs what is commonly-known in the art as "low-level" processes of inkjet printer 10.

Figs. 1 and 2 show hardware components that adapt inkjet printer 10 for sensing consumable ink in ink reservoir 14a/b/c/d. An RF (Radio Frequency) transceiver 50 is connected, via a multiplexing switch 58, to antennae 56a/b/c/d/e/f/g/h. Multiplexing switch 58 allows transceiver 50 to communicate independently with multiple antennae, but limits communication of transceiver 50 to one antenna 56a/b/c/d/e/f/g/h at a time. A transponder 54a/b/c/d/e/f/g/h, configured as described subsequently, is integrally attached to, or disposed within, ink reservoirs 14a/b/c/d, cleaning fluid bottle 16, printhead 22, waste bottle 18, and/or paper tray 20.

Referring again to Fig. 1, there may be many variations as to layout and placement of ink reservoirs 14a/b/c/d, cleaning fluid bottle 16, waste bottle 18, and paper supply. For example, paper media could alternately be supplied in roll form (as is the case, for example, with the "HP 755CM"™ printer from Hewlett-Packard Company, located in Palo Alto, California). Cleaning fluid is not required for all printhead 22 types. Also, ink reservoirs 14a/b/c/d may be supplied in a number of different forms.

Fig. 2 shows, in schematic form, how the present invention provides sensing of consumables within inkjet printer 10. An RF transceiver 50 is connected to machine control processor 32 internal to apparatus 10. Such a transceiver 50 may be a "Model S2000" transceiver, available from Texas

Instruments, Incorporated, located in Dallas, Texas, USA. Alternatively, transceiver 50 may use a "Model U2270B"™ transceiver, available from Vishay-Telefunken Semiconductors, Incorporated, located in Malvern, Pennsylvania, USA. Transceiver 50 connects, via a multiplexing switch 58, to antenna 56a/b/c/d/e/f/g/h located at each of a plurality of locations, with one antenna 56a/b/c/d/e/f/g/h respectively associated with the consumable items to be sensed.

In operation, transceiver 50 is capable of transmitting a first electromagnetic field 64 of a first predetermined frequency, for reasons disclosed presently. Transceiver 50 is also capable of receiving a second electromagnetic field 66 of a second predetermined frequency, for reasons disclosed presently. Typically, the same frequency serves for both first and second electromagnetic fields 64 and 66.

An RF transponder 54a/b/c/d/e/f/g/h is integrally connected to each consumable item, as part of the consumable package. Each transponder 54a/b/c/d/e/f/g/h can be an "SAMPT" (Selective Addressable Multi-Page Transponder), part number "RI-TRP-IR2B" available from Texas Instruments, Incorporated. Alternately, each transponder 54a/b/c/d/e/f/g/h may be a "Model TL5550"™ transponder, available from Vishay-Telefunken Semiconductors, Incorporated. Especially advantageous for attachment to consumable paper or film, a low-profile device such as a "TAG-IT™ Inlay" available from Texas Instruments, Incorporated could alternately be used for transponder 54a/b/c/d/e/f/g/h.

RF transponders 54a/b/c/d/e/f/g/h are preferably low-power devices that derive their source power from the first electromagnetic field 64 emitted by transceiver 50. By way of example only, and not by way of limitation, transponders 54a/b/c/d/e/f/g/h are generally cylindrical, smaller than 4 mm in diameter and less than 32 mm in length. This allows transponders 54a/b/c/d/e/f/g/h to be compact and thus easily attached to consumables.

As Fig. 2 illustrates, transceiver 50 communicates, via a separate antenna 56a/b/c/d/e/f/g/h, with each of transponders 54a/b/c/d/e/f/g/h. Transceiver 50 polls a single transponder 54a/b/c/d/e/f/g/h at a time using any one of a number

of possible multiplexing schemes. In the preferred embodiment, multiplexing switch 58, using techniques and components well-known in the art, makes the electrical connection between a specific antenna 56a, 56b, 56c, 56d, 56e, 56f, 56g, or 56h and transceiver 50 in order to poll a corresponding transponder 54a, 54b, 54c, 54d, 54e, 54f, 54g, or 54h. Alternate mechanisms for polling individual transponders 54a, 54b, 54c, 54d, 54e, 54f, 54g, or 54h include use of a plurality of microreader modules, such as a "RI-STU-MRD1 Micro-reader"™ available from Texas Instruments, Incorporated. Using this scheme, a microreader module, connected to machine control processor 32, would be disposed within apparatus 10 near the location of each transponder 54a/b/c/d/e/f/g/h.

Yet another alternative polling technique employs a "non-collision" algorithm for communicating with multiple transponders grouped in a confined area. Briefly, this algorithm works using a loop that proceeds in steps to increase transceiver 50 RF output power from an initial low value as transceiver 50 repeatedly polls for a transponder 54a, 54b, 54c, 54d, 54e, 54f, 54g, or 54h. As soon as it detects a transponder 54a, 54b, 54c, 54d, 54e, 54f, 54g, or 54h, transceiver 50 communicates with the transponder 54a, 54b, 54c, 54d, 54e, 54f, 54g, or 54h, then temporarily disables the transponder 54a, 54b, 54c, 54d, 54e, 54f, 54g, or 54h. Transceiver 50 then repeats polling, incrementing its RF output power level slightly with each polling operation, to locate, communicate with, and then temporarily disable the next available transponder 54a, 54b, 54c, 54d, 54e, 54f, 54g, or 54h. In this way, transceiver 50 communicates with multiple transponders 54a/b/c/d/e/f/g/h in order of their return signal strength, until all transponders 54a/b/c/d/e/f/g/h have been polled.

Transceiver 50 is electrically coupled to machine control processor 32, by means of a standard interface (such as, for example, RS-232C serial connection). This connection, in conjunction with any of the polling mechanisms described above, allows machine control processor 32 to control the operation of transceiver 50 so that it can successively poll individual transponders 54a/b/c/d/e/f/g/h that correspond to each consumable that is currently loaded in

09631605.054734

inkjet printer 10, in order to access information from each transponder 54a/b/c/d/e/f/g/h.

As Fig. 2 shows, communication via antenna 56a/b/c/d/e/f/g/h between transceiver 50 and transponders 54a/b/c/d/e/f/g/h can take place over a relatively limited distance (e.g., about 3 feet or 91.44 centimeters). This allows transceiver 50 to be mounted or placed within inkjet printer 10 at a convenient location, allowing retrofit of transceiver 50, along with multiplexing switch 58 and antennas 56a/b/c/d/e/f/g/h. This, of course, allows upgrading of existing equipment.

It is instructive to note how transceiver 50 communicates with transponder 54a/b/c/d/e/f/g/h, which are disposed at a locations within inkjet printer 10. Transponder 54a/b/c/d/e/f/g/h is tuned to the RF carrier frequency emitted by transceiver 50. Upon receiving an initial RF signal from transceiver 50, transponder 54a/b/c/d/e/f/g/h circuitry obtains, from the emitted electromagnetic energy, sufficient energy to provide source voltage for its internal circuitry. Thus, no battery is needed to separately power transponder 54a/b/c/d/e/f/g/h.

Each transponder 54a/b/c/d/e/f/g/h is individually programmed with an unique identifying address code (ID). As a final stage in manufacture, transponder 54a/b/c/d/e/f/g/h is programmed to store its ID along with other data that is characteristic of the consumable. In the preferred embodiment, transponder 54a/b/c/d/e/f/g/h is assembled with the consumable, but does not require programming until final assembly. This obviates the need to track a consumable with its corresponding transponder 54a/b/c/d/e/f/g/h during manufacture.

Referring to Figs. 2 and 3, transceiver 50 has both read and write access to transponder 54a/b/c/d/e/f/g/h memory data, which is stored in a plurality of memories 55a/b/c/d/e/f/g/h coupled to respective ones of the transponders. For sake of clarity, only memories 55a/b/c/d/g are shown, it being understood that memories 55e/f/h are also present and coupled to their respective transponders 54e/f/h. As will be described subsequently, this allows transponder

54a/b/c/d/e/f/g/h to store useful information on actual usage in addition to its stored information on manufacture.

To communicate with an individual transponder 54a/b/c/d/e/f/g/h, transceiver 50 encodes the unique identifying address code as part of its emitted signal, along with a command to read data from or to write data to (i.e., "program") transponder 54a/b/c/d/e/f/g/h. Transponder 54a/b/c/d/e/f/g/h responds to transceiver 50 communication only when it has been addressed correctly. This mechanism allows transceiver 50 to specifically address an individual transponder 54a, 54b, 54c, 54d, 54e, 54f, 54g, or 54h, and helps to avoid interference signals from a nearby transponder 54a, 54b, 54c, 54d, 54e, 54f, 54g, or 54h that might be unintentionally activated by the received signal from transceiver 50.

In addition to selective addressing, there are other data security options available with the SAMPT device used for transponder 54a/b/c/d/e/f/g/h. Individual memory blocks or "pages" can be separately locked to prevent inadvertent overwriting of stored data. Commands are available to allow access to individual pages only, so that transceiver 50 can be permitted to read or write only specific data from transponder 54a/b/c/d/e/f/g/h.

Consumable receiver media, inks, and cleaning fluids are adapted for sensing by attachment of a transponder 54a/b/c/d/e/f/g/h to the consumables packaging. For consumable fluids, the following are exemplary methods for transponder attachment:

(a) Attachment to the outside of the consumables package. In the preferred embodiment, transponder 54a/b/c/d is attached to the outside surface of ink reservoir 14a/b/c/d. Glue or adhesive tape, for example, holds transponder 54a/b/c/d in place. Similarly, transponder 54e is attached to the outside surface of cleaning fluid bottle 16 and transponder 54g is attached to the outside surface of waste bottle 18.

(b) Insertion within the consumables package. In an alternate embodiment, transponder 54a/b/c/d is disposed within ink reservoir 14a/b/c/d. Sealed within a plastic capsule, transponder 54a/b/c/d is protected from contact with the ink fluid and is able to communicate with transceiver 50, since transponder

54a/b/c/d will lie on the bottom of ink reservoir 14a/b/c/d. Similarly, transponder 54e can be inserted inside cleaning fluid bottle 16 and transponder 54g can be inserted inside waste bottle 18.

For paper 24 in roll form, transponder 54h can be attached to or inserted within the core that holds the paper roll. For paper in sheet form (used to load a paper tray), a separate loading sheet can be provided with the paper 24 package, where the loading sheet includes an attached transponder 54h. Or, each sheet of paper 24 can include an attached transponder 54h, using a miniaturized transponder 54h. Similarly, other media could include a transponder attached to packaging or to the substrate material itself. Another transponder 54f is attached to printhead 22, in a suitable position that does not hinder printhead 22 installation or operation.

09754305 - 050604

By way of example only and not by way of limitation, the data stored in transponder 54a/b/c/d that is attached to ink reservoir 14a/b/c/d may be any of the exemplary data displayed in Table 1 hereinbelow.

Table 1. Data Stored in Transponder 54a/b/c/d for Ink Reservoir 14a/b/c/d

Data Stored	**Number of Bits**	**Description**
Consumable Type Identifier	8	An 8-bit number encoding the type of ink consumable.
Product Code	40	10-digit product code. (May not be required if Consumable Type Identifier provides enough data.)
Catalog Number	32	For example, C349.
Manufacture Date	16	16-bit encoded date. Includes 4-bit month, 5-bit day, 7-bit year components.
Ink Properties	256	Encoded data giving surface tension, solvent concentration, colorant usage, binder and additive usage, data on chemical composition and absorption properties.
Sensitometric Data	128	Encoded parameter values allowing characterization of sensitometric response for this ink, including gamut-mapping coordinates, density values.
Usage Level	32	32-bit value indicating level or usage data for contents of this ink reservoir 14a/b/c/d.

As Table 1 shows, data included in transponder 54a/b/c/d for an ink consumable include both data from manufacture (written to memory at the factory) and data from usage (written to memory and updated based on number of prints created).

By way of example only and not by way of limitation, the data stored in transponder 54f that is attached to printhead 22 may be any of the exemplary data displayed in Table 2 hereinbelow.

Table 2. Data Stored in Transponder 54f for Printhead 22

Data Stored	**Number of Bits**	**Description**
Consumable Type Identifier	8	An 8-bit number encoding the type of printhead 22.
Product Code	40	10-digit product code. (May not be required if Consumable Type Identifier provides enough data.)
Catalog Number	32	For example, PH33.
Manufacture Date	16	16-bit encoded date. Includes 4-bit month, 5-bit day, 7-bit year components.
Printhead Properties	128	Encoded data giving printhead 22 type.
Usage Counter	32	32-bit counter recording usage data for printhead 22.

3654350.1

By way of example only and not by way of limitation, the data stored in transponder 54h that is attached to paper 24 may be any of the exemplary data displayed in Table 3 hereinbelow.

Table 3. Data Stored in Transponder 54h for Paper 24

Data Stored	**Number of Bits**	**Description**
Consumable Type Identifier	8	An 8-bit number encoding the type of paper 24.
Product Code	40	10-digit product code. (May not be required if Consumable Type Identifier provides enough data.)
Catalog Number	32	For example, W558.
Manufacture Date	16	16-bit encoded date. Includes 4-bit month, 5-bit day, 7-bit year components.
Paper Properties	256	Encoded data giving coatings type, absorption rate, density value, light-fastness rating, paper composition (barrier/receiver/base layers).
Usage Counter	32	32-bit counter recording usage data for paper 24.

By way of example only and not by way of limitation, the data stored in transponder 54e that is attached to cleaning fluid bottle 16 may be any of the exemplary data displayed in Table 4 hereinbelow.

Table 4. Data Stored in Transponder 54e for Cleaning fluid Bottle 16

Data Stored	Number of Bits	Description
Consumable Type Identifier	8	An 8-bit number encoding the type of cleaning fluid.
Product Code	40	10-digit product code. (May not be required if Consumable Type Identifier provides enough data.)
Catalog Number	32	For example, CL60.
Manufacture Date	16	16-bit encoded date. Includes 4-bit month, 5-bit day, 7-bit year components.
Solution Properties	128	Encoded data giving solution type, solvent formulation, volatility data.
Usage Level	32	32-bit value indicating usage level data for cleaning fluid bottle 16.

By way of example only and not by way of limitation, the data stored in transponder 54g that is attached to waste bottle 18 may be any of the exemplary data displayed in Table 5 hereinbelow.

Table 5. Data Stored in Transponder 54g for Waste Bottle 18

Data Stored	**Number of Bits**	**Description**
Consumable Type Identifier	8	An 8-bit number encoding the type of cleaning fluid included in waste bottle 18.
Product Code	40	10-digit product code. (May not be required if Consumable Type Identifier provides enough data.)
Level	32	32-bit value indicating relative level of fluid in waste bottle 18.

Among its functions, machine control logic processor 32 runs a program that controls various aspects of the print operation. Variables under control of this program include, for example, writing speed, drying time, and ink dot size. In order to determine how to adjust these operating variables, machine control logic processor 32 accesses stored information from the memory associated with each consumable before beginning a print job. Machine control logic processor 32 then uses the accessed information to alter the way it processes the print job, based on a stored program.

When a new consumable is first loaded in inkjet printer 10, an initial identification sequence takes place, during which transponder 54a/b/c/d/e/f/g/h on the newly loaded consumable is initially read and its data stored by machine control processor 32. This sequence can be operator-initiated, such as by entry of a command on control console 30. Alternately, consumable initialization can be initiated by sensing a mechanical event (such as the closing of front panel 12 on inkjet printer 10.)

While the invention has been described with particular reference to its preferred embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements in the preferred embodiments without departing from the scope of the invention. Therefore, what is provided is a printer and method therefor adapted to sense data uniquely associated with a consumable loaded into the printer.

09675350

PARTS LIST

10. Inkjet printer

12. Front panel

14a/b/c/d. Ink reservoir

16. Cleaning fluid bottle

18. Waste bottle

20. Tray

22. Printhead

24. Paper

26. Imaging drum

30. Control console

32. Machine control logic processor

34. Pumping assembly

50. Transceiver

54a/b/c/d/e/f/g/h Transponders

55a/b/c/d/e/f/g/h Memories

56a/b/e/d/e/f/g/h Antennae

58. Multiplexing switch

64. First electromagnetic field

66. Second electromagnetic field